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CONVERGENT STRABISMUS

Marshall M. Parks, M.D.

A condition of improperly aligned eyes is defined as being strabismus. The most common form is convergent strabismus. Since the visual directions of the eyes cross, the descriptive term of "cross-eyes" is well used to identify this condition.

ETIOLOGY

There are two main types of convergent strabismus, each having a separate etiology. Frequently, however, both etiological factors are found in an isolated case. The first type of "cross-eyes" has as its cause an abnormal convergent alignment that appears to be congenital, and for this reason will hereafter be referred to as *congenital convergent strabismus*. There are many hypotheses attempting to explain the cause of such a congenital malalignment, but actually, no certain etiological factor is known. There is probably some relationship between this type of convergent strabismus and divergent strabismus. The ideal situation is to be born with parallel eyes and fortunately the vast majority of the population is; some few are malaligned on either the convergent or divergent side of parallelism by various degrees. These abnormal alignment cases occur sometimes in accord with the laws of heredity, while others occur sporadically.

The other type of convergent strabismus is caused by accommodation, therefore it will be referred to as *accommodative convergent strabismus*. It is explained by the fact that accommodation and convergence are associated so that when one accommodates he automatically converges. An excessive amount of convergence associated with the accommodation causes accommodative convergent strabismus. The excessive amount of convergence results from one or a combination of two distinct causes: either there is an abnormal association of convergence and accommodation; or there is a large hypermetropic (farsighted) refractive error. The former is most apt to produce convergent strabismus while viewing near objects since normally accommodation is necessary for clear vision at this time. The latter will cause strabismus regardless of whether viewing distant or near objects since accommodation is necessary to negate the farsighted refractive error before clear vision is possible even while viewing distant objects.

CLINICAL RECOGNITION

The congenital type of convergent strabismus is usually apparent in the first few weeks of life. It is sometimes alarming just how "cross-eyed"

these children are. At the other extreme of the scale is the very minimally "cross-eyed" child whose condition defies detection until a routine ophthalmological examination brings it out at some later date.

Children with accomodative convergent strabismus have normally aligned eyes until they first start to accommodate. It is only after accommodation begins that these children develop "crossed-eyes"; this occurs usually at 2½ years of age but may occur intermittently from the age of 1 year or perhaps even a few months earlier. On the other hand, the crossing may not develop until the child is starting the first grade of school, i.e., at a time when the child is confronted with a situation that demands clear vision. At this time the accommodation required to produce clear vision calls forth its associated convergence and, as long as the vision remains clear, the eyes are crossed. When the circumstance that demanded clear vision passes, the accommodation relaxes and its associated convergence diminishes. Now the eyes return to their former straight position, but the vision is blurred because the farsightedness is not compensated for by accommodation. As this cycle is repeated over and over during the day, the observer sees intermittently "crossed-eyes."

CLINICAL COURSE

The congenital type of convergent strabismus usually remains relatively unchanged throughout the developmental period of the child, although an increase in the degree of "crossing" may occur at any age beyond 1 year. If such occurs it is most likely due to the child's beginning to accommodate and eventually an accommodative convergent strabismus becomes superimposed upon the congenital convergent strabismus.

Early in the course of development of the accommodative type of convergent strabismus the "crossing" occurs intermittently. Following the onset of this condition, three possible clinical courses may ensue: 1) the intermittent "crossing" pattern may persist throughout the lifetime of the individual, i.e., eyes straight while not accommodating but crossed while accommodating; 2) eventually the frequency and duration of the intermittent "crossing" may increase to the point that it fuses into a pattern of constant crossing; 3) the intermittent "crossing" may remain unchanged for several months to a few years after its onset and then gradually improve spontantously until it completely disappears. This is by far the most improbable of the three possible clinical courses that untreated accommodative convergent strabismus may follow. The most common sequence in the untreated case is progression from intermittent crossing to constant crossing, and the inevitable development of all the complications of constant crossing.

SYMPTOMS AND ADAPTATIONS TO THEM

Children with congenital convergent strabismus suffer very few visual symptoms. This paucity of visual symptoms is attributed to the fact that they have never developed "fusion." In ophthalmology we refer to fusion as the cerebral visual skill of fusing the image presented to each retina into one perception. The development of fusion is dependent upon the eyes being straight. Consequently, if the eyes are congenitally "crossed" the retinal images can not be fused and the normal seeing habits of fusion are not learned. This does not provoke the annoyance of "double vision," however, since the child adapts to this situation by using one eye at a time, usually in an alternating pattern.

About the only real visual symptoms congenitally convergent aligned children experience occur when they become older. Having no fusion ability they do not possess the most refined type of depth perception known as stereopsis. This causes them to perform in an inferior manner when confronted with certain extreme types of visual tasks, such as hitting a baseball, flying a jet plane or attempting to view a stereo-photographic set up of some kind.

All too frequently this type of child's most serious symptom is not of a visual nature; instead, it must be classified as emotional. As these children develop they soon become aware of the poor appearance created by their "crossed-eyes." Personality problems are the natural complication to the sustained embarrassment the sensitive child experiences.

The child with accommodative convergent strabismus, on the other hand, experiences very annoying visual symptoms from the time the strabismus first has its onset. Having been born with straight eyes, the cerebral visual skill of fusion has developed to a high degree. When accommodation is first used to clear the vision, the convergence associated with it crosses the eyes and double vision is experienced. Since diplopia is annoying there is a strong stimulus to return the eyes to the straight position as soon as possible after the occasion that demanded clear vision has passed. This is the reason why accommodative convergent strabismus starts with an intermittent "crossing" pattern. The child confronted with such a problem finds himself in a visual dilemma. If his vision is clear he sees "double" and if blurred he sees "single". Such a visual dilemma manifests itself in myriad ways in the total make up of the child's personality, the most common finding being irritability.

The desire for clear vision is innate. This is the reason why the frequency and duration of the "crossing" in intermittent accommodative convergent strabismus tends to increase. Eventually it may increase to the point where

the strabismus is no longer intermittent, but instead becomes constant. The development of the constant "crossing" is made all the easier by the gradual cerebral adaptation to the diplopia, a process accomplished by suppressing the visual information received from one eye and acquiring some additional abnormal seeing habits. Apparently there is more than cerebral adaptation to constant "crossing." In addition, there are probably some mechanical changes that take place in the converging muscles (medial recti). The best practical testimony that confirms this suspicion is that eliminating the accommodation, as can be done by prescribing glasses, often does not do away with the "crossing" once it has progressed to the constant phase, whereas glasses easily control the "crossing" if it is only intermittent at the time they are prescribed.

TREATMENT

Ideally, the congenital convergent strabismus cases should be seen by the ophthalmologist for the first time at about 6 months of age. A 6 month old infant is passive and easy to examine, yet alert and visually interested in his environment. This happy combination makes for a good examination. But most important, it is ideal from a physiological point of view to correct this problem at a very young age so that these children are given the maximal opportunity to develop fusion. Furthermore, it is good for the morale of the parents if they know that something can be done to correct their child's "cross-eyes" during infancy.

If the vision is good in each eye, no patching is necessary, but patching is started at 6 months of age if the vision is poor in one eye. Glasses do not correct the congenital "cross-eyed" problem. However, the amount of crossing may increase when the child starts accommodating (usually around the age of 1 year or older) and glasses may be necessary to correct that portion of the strabismus caused by accommodation.

Surgery is necessary in order to correct the congenital convergent alignment. No skin incision is made and no scars are visible on the eyeball a few months after surgery. Anesthesia is not a problem in the hands of a proficient pediatric anesthesiologist. The discomfort to the little patient is slight. The eyes are bandaged for only a few hours post-operatively. The child uses the eyes the day after surgery. They are light sensitive and lacrimate for 3 or 4 days and some discomfort may be experienced comparable to that felt in moving a cut knuckle, on moving the eyes. Discharge from the hospital occurs the morning after surgery.

The age that surgery should be performed is in general as young as possible. There are two temporizing factors to take into consideration when applying this rule. The patient should be sufficiently co-operative to permit accurate examination so that the surgeon can determine the amount of

convergent alignment that requires correction. Secondly, the problem of anesthesia safety must be weighed in the surgeon's mind. If the pediatric anesthesia is excellent, elective strabismic surgery does not create unwarranted risk in young children, even those as young as 8 or 9 months of age. The surgeon must assume the responsibility of determining the competency of the anesthesiologist before deciding what age child is safe to be operated on with minimal risk.

It is sometimes necessary to do more than one operation for such a type of strabismus in the event the first surgery does not accurately correct the problem. In some cases the quantity of malalignment is so large that two operations are planned rather than trying to accomplish the entire correction in one procedure. A second operation may be done as early as 6 weeks following the first one.

The child with accommodative convergent strabismus should be seen as soon as the physician or parents are aware of the intermittent crossing. This is the tip off that the child is in trouble. The initial treatment consists of prescribing some method that will control the accommodation. This in turn will limit the convergence associated with the accommodation that caused the eyes to become crossed. The most orthodox means for controlling the accommodation is the use of glasses. A medical means of controlling the accommodation pharmacologically is rather new and not fully evaluated, but does offer some promise. The medication is delivered in eye drops and the currently most popular is di-isopropyl fluorophosphate (DFP).

Many of these children need help only during the early formative period of their life. Many of them will spontaneously improve particularly as they approach and go beyond the age of 7. The improvement may be sufficient to permit them to do without glasses, either on a full time or a part time basis. In the event that they do not spontaneously improve, a routine of diminishing strength DFP therapy, or orthoptics (eye exercises) are valuable in teaching them how to accommodate without converging over and crossing their eyes.

The neglected child who has developed the constant type of crossed eyes usually needs more than glasses to straighten the eyes. Following a routine of patching, in the event the vision is poor in one eye, surgery is necessary to correct that amount of fixed convergent alignment that is not eradicated by glasses. In this type of complicated case orthoptics may be helpful in teaching the school age child the forgotten cerebral visual skill of fusion. All these complications and their lengthy expensive corrections can be avoided if the child with intermittent accommodative convergent strabismus is given the proper treatment at the right time. This means early referral to the opthalmologist of any intermittently "cross-eyed" child and early prescription of glasses or eye drops.

SUMMARY

There are two main types of convergent strabismus: 1) the congenital "crossed-eyes" which should be surgically corrected at a very young age; and 2) the accommodative convergent strabismus which is caused by accommodating in order to clear the vision. This type of strabismus has its onset in previously straight eyes somewhere between ages of 1 and 6 (usually about 2½ years) and occurs intermittently at first. If neglected the crossing may increase in frequency and duration and eventually become constant. The treatment is simple, inexpensive, and may be necessary for only a brief period if started early while the "crossing" is intermittent. Glasses, or in some instances eye drops (DFP) are the means of treatment. Eye exercises may be helpful in school age children. The treatment is difficult, prolonged, and relatively expensive if not instituted until the "crossing" has become constant. Glasses, eye drops, patching, eye exercises, and surgery are usually necessary to correct the problem that has reached this phase of complication.

TREATMENT OF PSYCHOSOMATIC PROBLEMS IN INFANTS*

(WITH EMPHASIS ON RUMINATION)

Reginald S. Lourie, M.D., Med. Sc.D.

The thinking in etiological terms in the field of psychosomatic medicine has consistently implicated infantile experiences as basic factors in establishing points of fixation. Therefore, there has been increasing interest in the actual psychosomatic involvements in infancy and a body of information has been building up concerned with the genesis of such problems. This has not been matched by an equivalent interest in overcoming these disturbances. Spitz's suggested approaches[12] have been the most definitive thus far.

In the past 6 years the Department of Psychiatry of Children's Hospital has been concerned with 14 infants ranging from 5 to 11 months of age in whom psychosomatic symptoms have had such profound effect in spite of the best medical thinking, that if uninterrupted a fatal outcome could be expected. The diagnoses included cyclic vomiting in 2 cases, diarrhea in 8, and rumination in 4.

In most of these infants where the psychosomatic process had progressed to a physically dangerous point, we could see a characteristic picture of a

* This talk was given at the first annual Alumni Day proceedings, Children's Hospital, May 21, 1955.

marantic infant. When they were not crying or sleeping they turned away from their environment staring at crib sides or at the ceilings. Some followed the movements of those within range of vision, only to cry or turn away when anyone came near. There was often preoccupation with parts of their own bodies; usually the hands, fingers or fists were in the mouth, or the hand waved rhythmically in front of the eyes. Some indulged in head rocking.

Usually these children had been thoroughly studied, having almost literally had "an instrument in every orifice," with negative or equivocal results. A characteristic patient had been hospitalized at least twice before. There had been definite improvement each time before the more serious manifestations of severe physical depletion were prominent. A point was reached where there was only transitory benefit from special regimes and/or parenteral approaches. As soon as the latter were abandoned, there would be physical regression in the presence of continuation of the vomiting, diarrhea or rumination.

Sometimes the pattern of occurrence of symptoms forced the medical staff into awareness of large emotional components in the illnesses. For example, an infant with a history of 10 to 30 watery stools per day, stopped its diarrhea within 24 hours after hospital admission. Medical, bacteriological and chemical studies were negative. The child was discharged in good chemical balance, only to be returned again with 10 to 30 watery stools daily within a few days. Again this cleared up within 24 hours and again physical and laboratory studies were negative. Sometimes such recurrent episodes were repeated 3, 4 or more times before the severe downhill course began, and referral for psychiatric therapy was initiated. There is still an understandable reluctance to refer an infant less than a year of age for psychiatric attention.

Since these were infants for whom the outlook was critical, strong efforts were necessary. The nursing staff came to see that special, individual care for these babies was as important and as life-saving as special nursing for a patient with a tracheotomy, for example. The babies were first of all placed near the nursing station so that there was some activity to be seen and heard much of the time. This served one specific purpose: it brought them out of the back cubicles where they usually were, possibly because there they would be less anxiety producing to the helpless staff.

Since these infants had obviously turned away from the world, having withdrawn their interest from their surroundings and reinvested it in the self, any attempt at emotional "replacement" therapy to accompany the dietary, blood and biochemical replacements being provided were blocked. It quickly became apparent that the important *primary goal was to help these children to trust those around them and reinvest their libido in the substi-*

tute mothers available. This was not difficult in some of our patients, but 9 of the 14 were not interested in people; they continued to turn away, to scream when picked up, or to look vacantly or remain inert when held. Four of these began slowly to respond to continuing carrying, fondling and being talked to by specific nurses, nurses aides or attendants. These personnel, selected as it were by the babies themselves, were assigned to them alone.

Four other babies were quite challenging in that it became clear that any tactile contacts were the signals for further withdrawal or were obviously anxiety producing or even seemed to be painful at times. Experimenting showed that 3 of them responded to being talked to, 1 could be interested not in a person, but by bright colored articles of clothing or some of jewelry. These auditory and visual stimuli were gradually combined with rhythmic movement patterns, usually in the form of rocking their cribs. As there came to be gradual acknowledgment of the persons involved, obvious pleasure in being with them developed, as was evident with the others. This group suffered themselves to be held as time went on but never apparently really enjoyed it.

One 10 month old infant could not be interested by any of these approaches from adults. It was accidentally discovered that when put in a crib with another baby it was attentive and seemed to enjoy its incidental physical contact with the other child. Thereafter it was placed in a playpen with 1 or 2 active older children and began to reach out to them, fascinated by their motility. Gradually by holding another child on one knee, a nurse could hold the patient on the other knee and finally there could be acceptance of and satisfaction from the mother substitute.

The second step was to observe the patients for any pattern in their symptoms. In the majority it was found that an approximation could be made, i.e., it was possible to predict within limits when the rumination, vomiting or diarrhea would take place. Thus some of the babies brought back food or had loose stools immediately after feeding. Others waited a half hour. Still others held off sometimes until 2 or 3 hours later. Some confined their manifestations to the afternoon or evening.

When such patterns were known, an effort was made to be sure that holding, carrying or other physical contact would overlap with those periods when the symptoms could be expected to occur. In other words, if substitute satisfactions, particularly relationship satisfactions, could be made available to the infant at the time when the symptom seemed to be needed, it was hoped that the symptom could be foregone for the moment. If this happened consistently enough, possibly the altered physiological state could be brought back into balance. This alone was effective in a few cases. In a few others it resulted in a shift of the times when the symptoms occurred

so that there had to be a remapping of the times when the staff's efforts would have to be concentrated with the patient.

The most difficult to control with this tactic were those who shifted their ejective maneuvers to times when their special nurse was not available. Hazards to be watched for with this approach were the ease with which these physically depleted children could be over-stimulated and fatigued. If the nurses became emotionally fatigued by the unresponsiveness of a baby or by failure or by relapses, it could easily end in the attendant becoming bored.

The next step was to provide other forms of satisfaction and stimulation once these children were willing. Standard equipment on the wards began to include high chairs next to the nurses' desk, strollers, playpens and baby carriages. Toys that trial and error showed would interest individual infants were supplied for them. Their own motility patterns were used and encouraged as most of them emerged or re-emerged into more purposeful and consistent standing and crawling.

Once the first 2 stages were accomplished there was an improvement in the physical symptoms in almost all cases. (The chief exception was case # 4 below). One baby, after losing its special nurse, regressed, and was able to make a more permanent recovery in a foster home. The disappearance of the vomiting in the cyclic vomiters was comparatively rapid (36 to 48 hours). In 5 patients the diarrhea cleared up within 4 days. The others took from two weeks to a month to clear up. There was a wide variation in the length of time it took for the chief symptoms to subside in the ruminators (see below).

The 4 ruminators presented such wide variations in etiology and response to therapy that it seems worthwhile to report them briefly. Rumination (or mercyism) is a well known clinical syndrome which consists of regurgitation of food without nausea or retching. Often part of the food is reswallowed. The return of the food is usually stimulated by fingers in the mouth (all our ruminators had big mouths and long fingers). It is obviously a pleasurable act, is voluntary, and can become habitual. Loss of food may end in malnutrition and, where the more severe cases continue uninterrupted, the outcome is often fatal (up to 50 per cent). In each of our cases the onset of rumination was shortly after the establishment of the hand to mouth stage at about 3 months. There had been true vomiting intermittently since birth. Each of our cases had had series of allergic tests and diets, anti-spasmodic and sedative medication, thick, sticky feedings, and restraints. The latter included arm splints, chin straps and bonnets tied under so the thumb couldn't get into the mouth. The patients however, developed the ability to work the jaws and back of the tongue so that they could gag themselves and purposefully produce the return of food. Where

the jaws were immobilized some could accomplish this return of food by throwing their heads back and arching their backs.

Case # 1

Jean was a 5 month old white female whose parents were young, quite immature and unsure of themselves though well motivated. They were living a hand to mouth existence in furnished rooms. When the patient was 3 months of age they moved out into the country where the mother was alone a great deal of the time and became somewhat disorganized, tense and fearful of her welfare and the baby's. She was constantly doing something to the baby so that the child had no rest. In addition she described days when she carried the baby back and forth from the store ½ mile away, only to have to make 2 or 3 more round trips with the baby under arm for items she had forgotten. Phobic and compulsive thinking was prominent. The mother devoted herself to the child to the exclusion of the husband.

The child became irritable and then began the rumination at about 3 months of age. She lost weight consistently until she was hospitalized weighing about 7 lbs. at 4 months. She improved somewhat, gained 2 lbs. in 2 weeks and was sent home on an anti-allergic diet. She was readmitted at 5 months in a state of marasmus, still ruminating.

Medical study was negative except for a mild dilatation or relaxation of the cardiac end of the esophagus. Therapy for this produced no benefit. Neither did special and thickened feedings, anti-spasmodics, sitting up in a sling on the bed and arm restraints. Permission was obtained on psychiatric ward rounds to participate in the therapeutic approaches.

Jean turned out to be quite apprehensive and unresponsive with any of the ward personnel except for a thin, wiry, tense nurse's aide. With the assistance of this woman the program outlined above was begun. The baby began to respond slowly, taking feeding avidly from this person after having been reluctant about eating when held by anyone else. Within a week her ruminating became infrequent during the day and was evident only at night when the nurse's aide was not on duty. Her weight went from 8 lbs. to 10 lbs. in 2 weeks. In the third week the mother was brought in to replace the mother substitute gradually, and after each session with the child she saw a resident, who talked over her reactions and worked out with her the subjective feelings involved in the day's experience. A family agency was brought into the picture and helped the young couple make better living arrangements and to work out the family problems.

At 11 months there had been no rumination or vomiting and Jean weighed 18 lbs. No difficulties were reported and she was developing normally.

Case # 2

Jimmy was an 11 month old white male whose vomiting had been in evidence for his first 3 months of life. Rumination began at 3 months but dropped out within 2 weeks following hospitalization because of severe weight loss. At 8 months the vomiting began again so severely that in a week he had lost 2½ lbs. He retained only water and was rehospitalized. Frequent small, thick feedings plus anti-spasmodic medication were able to reverse the pattern of weight loss and he went home again in a week. Three months later he returned to the hospital in an emaciated state weighing 12 lbs. For two weeks he had increasingly lost interest in his mother, in eating and stopped putting anything in his mouth but his thumb. After 10 days of varying combinations

of restraints, clyses, thick feedings, transfusions (because of nutritional anemia), and sedation, his hydration was improved but he was withdrawn, unresponsive, and whining with any approach by the ward personnel.

Psychiatric study showed him to be the only child of a college graduate mother who was a very dependent person, unsure of her judgment. She had lived near her own mother in a small western city and had leaned on her mother for many decisions about the care of the baby. Her husband was a much more mature individual who was able to deal with his wife's anxieties except for those centering around the dependency status of the baby. He had left medical school temporarily for a career as a professional ball player and was traded to a Washington team where he brought his family when Jimmy was 6 months old. This meant road trips, leaving his wife alone in a city where she had no friends. She felt increasingly helpless, depressed and built up considerable tension. Jimmy was apparently comfortable in spite of this for about 2 months. At 8 months, shortly after his father went on a trip with the team, the rumination began again.

When the therapeutic regime outlined was introduced, Jimmy responded quite rapidly and within a week gradually stopped bringing back food even though when alone he would sometimes still suck his thumb. He remained in the hospital with this regime for 15 more days; the mother, who was being given psychiatric help, gradually spent more and more time with him until she had much more of his time than the special nurse. Weight gain was 2½ lbs. in this period. Six months later he weighed 25 lbs. and was reported to have no more rumination. The family was back in the home town and mother was actively in contact with a case work agency. One year later reports were that physical and personality development were continuing normally.

Case #3

Jack was a 9 month old colored male brought to the dispensary by his foster mother because he had been losing weight slowly for the last 2 months. This was in spite of his having been placed back on 3 hour feedings and even 2 a.m. feedings during much of this time in an effort to counteract the weight loss. There was a vague history of vomiting. He appeared to be so severely malnourished and stuporous that he was admitted immediately to the hospital. Physical and laboratory studies were negative. In the first week he vomited varying amounts and closer observations showed that this was accomplished by sucking briefly on 2 fingers. Arm restraints, a ruminator's cap, plugging nostrils, thick feedings, and sedation proved to be of no value. He brought back food in spite of this regime by working his tongue and the angles of his jaw.

When psychiatric referral was made on the 19th hospital day and the above routine applied, Jack proved to be one of the group that had to be approached without too much handling and chiefly by auditory contacts. There was a slow giving up of the rumination matched by a slow weight gain. There was still remnants of it two months later but he had gained from 9 lbs. to almost 13 lbs.

The history shows Jack to be the child of a 19 year old unmarried mother who had arranged for his adoption following delivery. Nothing was known of the father. He was born two months before term weighing 2½ lbs. and was kept in the hospital nursery for three months and discharged to the foster home weighing 5 lbs. The foster mother was middle aged and had four older children and another foster child under a year of age. It appeared that Jack was kept in a small back bedroom, and always in a bassinet which became too small for him. The other children were limited in being allowed near him. When the added feedings were ordered for him they were given via

propped bottles. He developed few motor skills and began to rock his head rhythmically from side to side. The foster mother put him in this restricting and confining environment because he was an "irritable" baby, so easily upset by the noise made by the other children in the house.

A series of psychological studies, Gessell and Cattell scales, done because of the problem of his adoptability, showed that, with weighing for prematurity, at 7 months he was considered superior, at 9 months he had regressed, and at 11 months had made considerable strides in recovery. These gains were evident clinically in his learning to crawl and stand. His head rocking also became less evident as increasing satisfaction from motility was available to him.

Jack went to another foster home where the agency kept close consultation liason between the hospital and the foster mother. He gave up the rumination entirely in 6 weeks after his new placement. When last heard from before his adoption at 18 months, he had no recurrence of the rumination. Although he was still responding more acutely and actively to loud noises and sudden temperature changes than most children, this was progressively less marked.

Case #4

John was a 7 month old colored male who had been vomiting since birth. His weight gain was slow and stopped at 5 months of age. He remained irritable, relatively sleepless and at times was impossible to pacify. Rumination began at 6 months of age and he began to lose weight and was hospitalized. Referral to the Department of Psychiatry was made in the first week of hospitalization in light of the previous experience with ruminators. John was found to have days when he was able to be interested in his environment, but there were more times when he was withdrawn, expressionless, cried a great deal and resisted the approaches of the special attendant assigned to him. He was not losing weight however, and his rumination was intermittent but never out of the picture for more than a half day at a time.

During an intercurrent specific diarrhea, a pediatric resident became suspicious of a diaphragmatic hernia because of upper abdominal distension and a peculiar tympany in the chest. Barium studies confirmed the diagnosis and there was surgical correction of the diaphragmatic defect. This was the beginning of a marked change in the infant's response to his environment and reversal of his presenting symptoms. It became apparent in retrospect that his manifestations had been attempts to relieve anxiety due to organic disturbances, probably chiefly pain.

DISCUSSION OF CASES

We were faced in these cases with a return of the personality to a state close to that of the newborn. Where relations with others had been established in these infants, external and internal conditions were encountered that necessitated a retreat of the personality from an interest in people and the outside world to an interest only in self. It was necessary to find ways in which this self interest could be stimulated into being directed toward the outside again. We were counting on the normal drive for such re-investment of interest if the situation and the people involved became "safe," particularly if they were not anxiety producing. The return to a state of withdrawal of interest in others in these children was not the same as in some cases of severe autism or childhood schizophrenia,[1] although at the height

of the symptoms it would be difficult to distinguish them from each other. The chief difference appeared to be in the constitutional endowment of these infants. Thus when an organic deficiency was produced by the psychosomatic process in addition to the unsatisfying or traumatic environment, the combination apparently produced a decompensation which in turn became anxiety producing in itself. The combination of internal and external sources of anxiety seemed to overwhelm the baby so that greatest possible regression to the safest possible state was the solution. In the schizophrenic infant the as yet unknown constitutional elements which make it difficult for the individual to tolerate anxiety are apparently irreversible in most cases. The regressions in most of our cases had no opportunity to become well fixed and were reversible. We do not know whether if untreated the babies who did not die would remain in this regressed position, but the possibility cannot be overlooked.

In case 3 the background of the child is not too different from those Spitz describes in cases of the syndrome he has labeled "hospitalism."[12] Even though in a home with a mother figure, the neglect of our patient was of a magnitude that no opportunity was available for it to establish relationships. This is in contrast to the first 2 cases where overstimulation or too much environmental tension made it unsafe to maintain an investment in the attachment to the mother. In each case the first step was the same, a gradual turning to its own body for substitute satisfactions. In the early stages of this regressive process the mother was not excluded. This re-creation of the state without attachments seemed to depend on the addition of the psychosomatically maintained organic process. The normal "8 months anxiety," long recognized by pediatricians, cannot be excluded as an added factor in cases 2 and 3 but not in cases 1 and 4. The question comes up whether the organic depletion may not be a precipitating factor in some of the cases of hospitalism described by Spitz.

The regressions we have discussed in these cases are not the true psychophysiological regressions to fixation points that are reported in older children and adults.[11] Some of the infants possibly could be said to be going back to previously established fixation points in the selection of psychosomatic symptoms. For example, the cyclic vomiters had earlier vomiting, but not of the same cyclical type. Some of the ruminators had dropped this manifestation for months, only to pick it up again. It was clear however, that in terms of genesis none of these infants had satisfactorily worked out their needs for mouth satisfactions. Over stimulation of the anal area as by enemas or suppositories was found in some of our infants with psychosomatically determined diarrhea. In other words, "reflex sensitivity (was) established by the mother's handling of a particular organ." When the organism is faced with excessive excitation, it attempts to get rid of this by subsequent active repetitions of the situation

that induced the excessive excitation. In other cases however, the selection of the psychosomatic manifestation seemed to be determined by the stage of motor development and ego awareness the individual happened to be in at the point where it couldn't deal by other means with the dose of anxiety present.

The rationale behind the second stage of the therapeutic program described in this study (i.e., the attempts to make sure the substitute mother was actively in the picture when the child's psychosomatic expressions were most active), was to interrupt the symptoms. There was a twofold basis for this. First, it was felt that if the physical state could be enhanced, the organically internally induced anxiety[4] would need to be dealt with less and less by the child. Secondly, we were dealing with a psychosomatic symptom that was potentially self-destructive. If it could be interrupted for long enough, at the same time that anxiety producing situations or frustrations were avoided it was postulated that the immature ego's defensive, especially restorative, attempts in its use of the symptoms would be needed less and less. It has been the repeated experience at the earliest age levels of functioning that if a pattern is interrupted for long enough (1–2 weeks) under proper conditions a new pattern could be substituted for it. There seems to be individual, constitutionally determined flexibility in making such adjustments to new standards and pressures.

This function of the symptom was apparently of such great importance to the organism that it took precedence over the homeostatic mechanisms of the body. The therapeutic approaches therefore had to be geared toward creating evidence that the new living situation was not overstimulating or understimulating, was minimally painful and frustrating, and was capable of offering satisfactions untinged with anxiety created by the mother, particularly at the times of the day when the baby was feeling most threatened.

Considerable work had to be done with the responsible adults in the environment of these infants. This was individualized and in the form of various combinations of educative, medical, psychotherapeutic case work and nursing approaches. Manipulation of the environment was sometimes necessary. The Children's Hospital Well Baby Clinic with its well-oriented pediatricians and nurses was of considerable assistance on the follow-up basis. Family and welfare agencies and the hospital's medical social work staff helped some mothers on a continuing basis. Such measures were usually started when possible before baby left the hospital. In most cases there was maternal anxiety in the presence of the infant's acute manifestations, if it hadn't been present before, and this as well as guilt had to be relieved before the baby was sent home.

The constitutional element in these cases cannot be overlooked. As both Gerard[7] and Deutsch[4] have pointed out, organic defects and illness, through

causing pain or malfunctioning produce anxiety. Certainly in at least 1 of our cases (case 4) this was the major element behind the psychosomatic symptoms. In other words, the hyperstimulation comes in such a case from within the organism itself, forcing it to experience painful stimuli at an intolerable level with resulting anxiety. It is clear that there are constitutional variations of the ability to tolerate anxiety. The mystery of what goes into these variations has beginning light thrown on it by recent studies such as those of Leitch & Escalona[10] and Berman and Escalona which show a wide range of constitutional responses is possible. Extra-sensitivities and characteristic organ responses are described by these authors.

This study has excluded many of the manifestations more commonly thought of as psychosomatic in the first years of life. However those involvements, related to allergy for example, such as asthma and eczema, do not usually have reactions as severe as those reported here and usually are dealt with by diets and desensitizations. Therefore it is not until past the second year that emotional factors are usually scrutinized. It would seem important from the hopeful experiences in early treatment to encourage psychiatric scrutiny in the first year if possible.

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ADENOIDAL-PHARYNGEAL-CONJUNCTIVAL VIRUSES IN COMMON RESPIRATORY DISEASE*

(PHARYNGO-CONJUNCTIVAL FEVER)

Robert H. Parrott, M.D.†

Undifferentiated respiratory disease or common respiratory disease of apparently non-bacterial origin has been a perennial headache to those dealing with the illness of children, the illnesses of military recruits, and the illnesses of industrial workers. In the past several years clinicians and virologists working together have made certain advances in the knowledge of these ailments and their etiology. I would propose to review for you a part of the story of these advances. The bulk of the work that I shall mention is that of Doctors Rowe, Huebner, and Bell at the National Institutes of Health and Dr. Ward at Johns Hopkins; Doctors Lockhart, Cohen, and Bogaert at this hospital have cooperated in some of the studies.

The story I am going to review had its beginning in a sense here at Children's. In 1952 and 1953, tonsillar and adenoid tissue was collected from children undergoing surgery at this hospital and at several others. These tissues were minced up and placed in test tubes for tissue culture. It was the hope that these tissues would provide an ideal host for the growth of common respiratory viral agents. Instead, over 50 per cent of the tissues themselves were found to contain viral agents which could be transmitted serially through other tissue cultures; these viruses and a group of closely related viruses are now named the adenoidal-pharyngeal-conjunctival (APC) viruses.

This group of APC viruses includes the cytopathogenic agents which were originally isolated from human adenoids undergoing spontaneous degeneration in tissue culture and which have been subsequently recovered from conjunctival and pharyngeal secretions and fecal material from human beings with acute respiratory infection. These agents are non-

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pathogenic for laboratory animals. They do show a unique destructive effect in tissue culture of epithelial tissues, particularly of a cell strain of cervical carcinoma tissue called HeLa cells, in monkey kidney explant and in human adenoid and tonsil tissue. They are ether resistant; they are heat labile; they are filterable; they resist antibiotics; and members of the group share a group specific, soluble antigen which gives a group reaction in a complement fixation test. These agents do however produce a type specific antibody in a neutralizing antibody test, and on the basis of neutralization tests it can be said that there are at least six immunologically distinct types of APC virus.

At the time of this talk, types 1 and 5 of this group have been found primarily in tonsils and adenoids but were present in one case each of acute pharyngitis. Types 2 and 6 have been isolated only from tonsils and adenoids. Type 4, which is synonymous with a virus called RI-67 by Dr. Hilleman, has been associated with acute respiratory disease in military recruits but was found once in pharyngeal lymphoid tissue. Type 3 virus, the prototype of which was first found in nasal washings of human volunteers in a common cold study, was not further linked with common colds at any time, but has been associated since with the human disease for which the name pharyngo-conjunctival fever is proposed.

Serologic studies, mainly neutralization tests, indicate that over 50 per cent of infants in the 6 to 11 months age group show evidence of having been infected with at least 1 type of APC virus; there is a sharp rise in evidence of infection from age 1 to 2; there is a less prominent increase in number of individuals with neutralizing antibodies from ages 3 to 5; gradually thereafter, there is increasing evidence of individuals having been infected with at least 1 and often all 6 types of APC virus up to adult life when almost 100 per cent of individuals tested show serologic evidence of having been infected with at least 1 of the virus strains. They are, then, very prevalent agents.

What do they do clinically? While sufficient data are not available concerning clinical aspects of most of the APC virus types, 2 well studied outbreaks have provided reasonably adequate information concerning the etiologic associations and epidemiology of type 3 APC infection. Evidence that the clinical picture which I will describe is associated with APC virus type 3 includes the information that: (1) these agents invaded the tissues of persons with this clinical entity; (2) they were found in the site of the pathologic lesion in the clinical entity; (3) they were not present in well persons who were in intimate contact with the individuals who had the illness; (4) these viruses were present in the acute stage of illness, not before it, and not after it; (5) they were associated consistently with a particular clinical entity; and (6) they were not found in other illnesses in

TABLE 1

Major Features of Pharyngo-Conjunctival Fever in a Ward Outbreak (8 patients)

Pharyngitis	7
Exudate	2
Rhinitis	7
Fever (5-6 days)	6
Cervical Adenopathy	5
Conjunctival injection	4

the outbreaks studied or in sporadic studies of many cases of respiratory and other kinds of illness. In addition, recent inoculation of these agents into human volunteers has reproduced the clinical entity which I am to describe. I might say that, originally, inoculation of these agents into the naso-pharynx of human volunteers did not reproduce this illness, and it was only after certain preparations of the viral agent were inoculated into the eye of human volunteers that the clinical picture was reproduced.

The first outbreak of pharyngo-conjunctival fever associated with type 3 APC virus infection occurred in a hospital ward and included 8 patients. A summary of the clinical features of illness in these patients is included in Table 1. Pharyngitis was a common complaint and finding. Two of the patients had exudative pharyngitis. Rhinitis was a very frequent symptom and sign. Fever of a high degree lasted for 5 to 6 days in 6 of the patients. Cervical lymphadenopathy and conjunctival injection were noted.

Figure 1 shows a typical fever chart and some of the leukocyte counts of a youngster who was infected with APC virus, type 3. You can see that there is a lack of severe leukocytosis, but there is some polymorphonuclear shift which progresses to a mild leukopenia and a restoration to normal of the differential count.

Figure 2 shows a representation of the illness in an older individual, a nurse, who was taking care of some of these patients. Her leukocyte counts are perhaps more representative and were performed over a longer period of time, and I think are fairly characteristic of other leukocyte counts that have been done in patients with this illness.

Table 2 summarizes the symptoms and signs that occurred in the second outbreak of APC type 3 infection studied. Fever occurred in 90 per cent of the individuals; sore throat was a complaint in 70 per cent; red eyes were noticed in $\frac{2}{3}$; headache in $\frac{2}{3}$; and some degree of malaise and weakness in many of the patients. Sporadic complaints were aching, cough, vomiting, diarrhea, and in a few instances epistaxis. Temperature elevation that lasted for four, five, or six days, was quite characteristic. Pharyngitis which consisted essentially of lymphoid hyperplasia with erythema of the lymphoid follicles occurred in $\frac{3}{4}$ of the individuals, and cervical

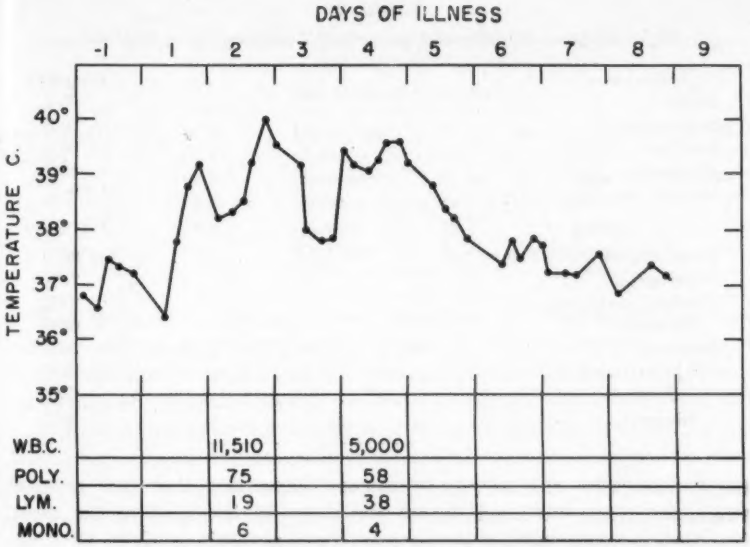

FIG. 1. Fever and leukocyte counts in 6 year old with pharyngo-conjunctival fever

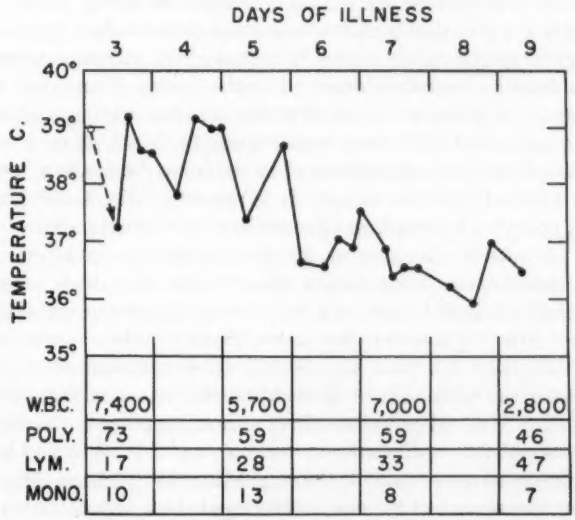

FIG. 2. Fever and leukocyte counts in 28 year old nurse with pharyngo-conjunctival fever

TABLE 2

Major Features of Pharyngo-Conjunctival Fever in a Camp Outbreak

Symptoms	*Frequency*
Fever	90%
Sore throat	70%
Red eyes	66%
Headache	68%
Malaise, weakness	72%
Signs	*Frequency*
Fever 102–104 for 4–5 days	90%
Pharyngitis	75%
Cervical adenopathy	75%
Posterior	66%
Rhinitis	50%
Conjunctivitis	75%
Unilateral	25%
Bilateral	50%

lymphadenopathy also in ¾. It was my impression that this cervical lymphadenopathy involved mostly the nodes in the back of the neck. Rhinitis was noted in ½ of the patients, conjunctivitis in ¾. In ¼ of the total group, this conjunctivitis was unilateral. This conjunctivitis was both bulbar and palpebral. It was not particularly pruritic and was accompanied by a great deal of exudation of liquid material. A few patients showed signs of meningismus; a few had cough and ronchi.

Pharyngo-conjunctival fever occurs both epidemically and sporadically, and the epidemicity is probably defined by the degree of immunity existing in a community or group attacked. It affects all ages, although mostly children, again because of their relative susceptibility. It affects both sexes, although interestingly enough, among adult contacts, the mothers were more frequently affected than the fathers. It is spread by direct contact almost surely and probably by respiratory secretions. The usual portal of entry is somewhat in question because of the points brought up by the human volunteer experiments I mentioned. There is a very high attack rate among susceptible individuals; in a 4 to 7 year age group the attack rate was 72 per cent in a summer day camp. There is a low carrier rate. No individual who did not have the clinical syndrome showed evidence of infection with the virus. There is evidence of advancing immunity with age. A question is raised as to the role of swimming pools in the dissemination of this agent during the summer at least, and I think it had better be left as an unsolved question with the suggestion that perhaps they do play some role in the spread of the agent. The incubation period is 5 to 6 days. The period of communicability is up to 9 days.

TABLE 3

Clinical Features of Infection with Type 4 APC Viruses in Military Recruits (33 patients)

Per cent showing symptoms

Sore throat	90.9		Dysphagia	75.8	Nausea—vomiting	27.3
Malaise	84.9		Cough	66.7	Eye ache	18.2
Fever	78.8		Headache	63.6	Chest pain	12.1
Chills	75.8		Hoarseness	63.6	Pneumonia	3
Coryza	42	72.7	Myalgia	33.3	Fever alone	0
Nasal congestion	56		Backache	27.3	Leukocytosis	31.3

The type 4 APC virus, as I have mentioned, has been associated with less well-defined acute respiratory disease of military recruits. Table 3 summarizes briefly the findings of a study at the Great Lakes Naval Training Center of "Recruit Disease," as some people are apt to call it, in the subjects of which there was evidence of infection with type 4 APC virus. As you can see, sore throat, malaise, fever, chills and nasal congestion were frequent complaints. Pneumonia occurred in only one individual in this study. The average duration of illness was 4 days, the range being 2 to 8 days. The reports of Hilleman and co-workers indicate that a type of primary atypical pneumonia occurring in Army recruits may well be due to infection with this type 4 virus (RI-67).

In summary, the APC or adenoidal-pharyngeal-conjunctival viruses are newly isolated epitheliotropic tissue culture agents. They have been associated predominately with an illness named pharyngoconjunctival fever, and with respiratory disease in military recruits. Unless the 3 major features of pharyngo-conjunctival fever are present, or unless it is occurring in an epidemic, I would hesitate to say that it is so definite a clinical entity as measles. If fever, conjunctivitis, and pharyngitis are present, or if a combination of them is present in the face of an epidemic, then I think one can be clinically definite without virologic background.

There remain problems in this field. First of all, are similar groups of viral agents responsible for the many other respiratory illnesses so often seen in practice? Secondly, concerning this very prevalent group of APC viruses, there are many questions one might ask. For example, are they associated with the very process of adenoid and tonsilar growth, with the lymphoid growth curve? The evidence of infection due to these particular viruses seems to correlate in time with such growth, and they have been found of course in a large percentage of children whose adenoids and tonsils were removed presumably because they were enlarged. Another question that is obviously important is: what other clinical entities might be associated with APC virus infection? A third question: what if any,

therapeutic management would be indicated for infection with these agents? I must say that no antibiotic or chemotherapeutic management seemed effective in the patients studied. The fourth question and perhaps the most provocative one is: what are the possibilities of vaccinating against these agents? They are very prevalent; there is evidence that they are responsible for a fair amount of respiratory disease; they can be grown readily in tissue culture. It is not unlikely that a safe, effective vaccine might be developed.

PHEOCHROMOCYTOMA

Report of A Cure in A Twelve Year Old Girl

James H. Stallings, Jr., M.D.

The differential diagnosis of hypertension in the pediatric age group seldom presents serious difficulty. The following case, the first child recognized at the Children's Hospital of the District of Columbia to have pheochromocytoma, presented more than usual interest in diagnosis and management.

CASE REPORT

L. M., a 12 year old white girl, was admitted to the private service of Dr. Preston A. McLendon on December 30, 1953 with complaints of nocturia, palpitation, and blurring of vision. She had been perfectly well until July, 1953, when she began having enuresis 2 or 3 times a week. She seemed otherwise well and was normally active until October, 1953, when she began to lose weight and to "look poorly." When she was seen by her family physician in late October, 1953, she was found to have hypertension, albuminuria, and microscopic hematuria. On November 1, 1953, she was admitted to another hospital complaining of dyspnea and palpitation on exertion. At this time she had a blood pressure of 166/100, normal ocular fundi, and a basal systolic murmur. Hematocrit was 48 per cent and sedimentation rate (Wintrobe) 5 mm. per hour. The urine was cloudy with a specific gravity of 1.004, albumin 100 mg. per 100 ml., and 2–3 red blood cells and 5–6 white blood cells per high-power-field. Phenolsulfonphthalein excretion was 40 per cent in 15 minutes, 73 per cent in 2 hours. Blood nonprotein nitrogen was 32 mg. per 100 ml. and 24 hour urine albumin excretion was 1.2 gm. The electrocardiogram was normal with sinus tachycardia. A diagnosis of subacute glomerulonephritis was made and she was discharged November 7, 1953, on bed rest and low salt diet. At home she complained of dizziness and headache when sitting up, progressive blurring of vision, and severe constipation. Her mother also observed intermittent periorbital edema. There had been a 7 pound weight loss from October, 1953 until admission to Children's Hospital on December 30, 1953. Past medical history and family history were non-contributory.

She appeared thin, well-developed, and chronically ill. Temperature was 99.4 (R), pulse 120, and respirations 24. Her blood pressure was 160/120 in the left arm and 190/140 in the left leg. She weighed 73 pounds. Visual acuity was markedly diminished.

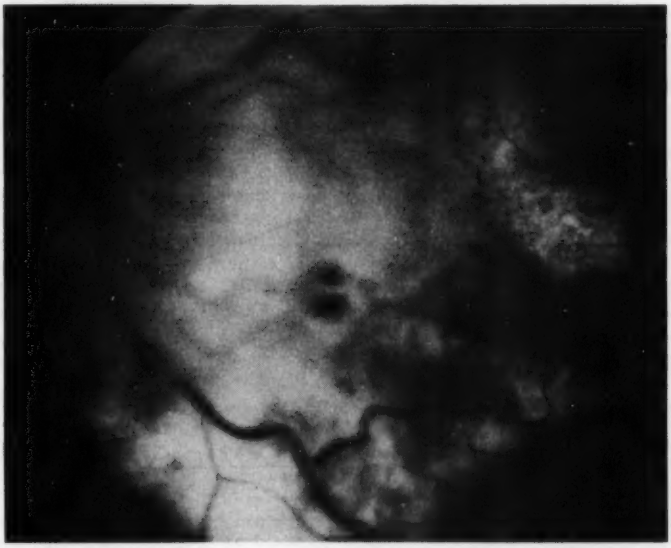

FIG. 1. Grade IV Hypertensive retinopathy

(Photo byEdmonds Optician)

She could successfully count fingers with either eye, but could not read newspaper headlines. No thyroid eye signs were noted. There was grade IV retinopathy with marked arteriolar spasm and segmentation of arterioles, superficial and deep hemorrhages, cotton-wool exudates, venous engorgement, and papilledema of five diopters (Figure 1). The thyroid gland was not palpable, but a bruit was audible over the left lobe. There was a grade II blowing, systolic murmur heard over the entire precordium. Pressure over the flanks caused no change in blood pressure. Femoral pulses were of good quality and quadriceps strength was grossly normal.

Admission hemogram showed 15.8 gm. hemoglobin per 100 ml.; microscopic examination of the urine revealed 1–2 red blood cells, 4–5 white blood cells, and occasional granular casts per high-power field. Blood urea nitrogen was 8.8 mg. per 100 ml., non-protein nitrogen 28 mg. per 100 ml., and creatinine 1.2 mg. per 100 ml. Serum proteins were normal. Phenolsulfonphthalein excretion was 30 per cent in 15 minutes and urine concentration (Fishberg) was impaired to 1.019. Urine cultures were sterile. The glucose tolerance test (Chart 1) showed a high curve. The basal metabolic rate was plus 28 per cent. Chest x-ray was normal. The electrocardiogram was interpreted by Dr. John O. Nestor as consistent with left ventricular preponderance and hypertrophy. An excretory urogram showed delayed function of the left kidney but retrograde pyelography showed normal pelvic shadows. Two provocative tests for pheochromocytoma were performed using histamine and etamon without pressor response. Marked depressor response was obtained with Regitine (phentolamine) 2.5 mg. intramuscularly and confirmed by repeat testing (Chart 2). The cold pressor test was negative, but on several occasions orthostatic hypotension was observed.

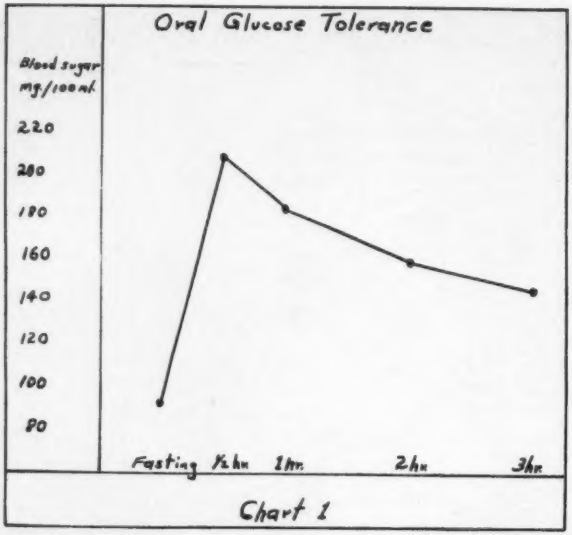

CHART 1. Oral glucose tolerance curve in patient with pheochromocytoma showing relative hyperglycemia unresponsiveness.

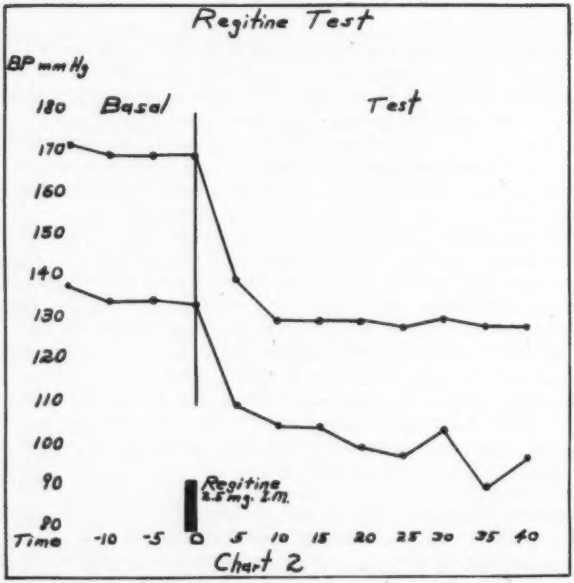

CHART 2. Hypotensive effect of regitine in patient with pheochromocytoma

During hospitalization weight loss continued and visual acuity diminished until she could not recognize faces of those standing at the foot of her bed.

Laparotomy was performed on January 26, 1954 by Dr. Crenshaw Briggs and Dr. Hilbert Sabin through an upper abdominal transverse incision. During induction with nembutal and ethylene her blood pressure remained about 150/110. When the skin incision was made blood pressure dropped abruptly to 90/76. Exploration of the right adrenal area revealed nothing abnormal and a biopsy was taken from the right kidney. When exploration of the left adrenal area was undertaken, blood pressure suddenly rose to 170/140. A smooth, pedunculated tumor 4.5 x 3.5 x 3 cm. was found at the inferior portion of the left adrenal gland. When the pedicle was clamped, blood pressure promptly fell to 80/60. L-nor-epinephrine (Levophed) was administered intravenously to control hypotension and was required at a diminishing rate for the first 36 hours post-operatively. No effect on hypotension could be demonstrated from the use of intramuscular doses of mephenteramine (Wyamine) sulfate or methamphetamine (Methedrine) hydrochloride.

Pathologic examination of the operative specimen was reported by Dr. E. Clarence Rice. "Gross examination: Specimen consists of an oval mass of tissue measuring 4.5 x 3.5 cm. x 3 cm. and weighing 20.5 gms. The surface shows a gray, moderately firm, thin capsule and the cut surface is pinkish gray, mottled and soft. Microscopic examination: Most of the tumor is made up of rather large cells with pink staining cytoplasm and large rather transparent nuclei, the cells having an acinar arrangement. Occasionally these cells have very large vesicular nuclei. In addition, there are found interspersed smaller cells with pyknotic nuclei. Fibrous cords extend through the cell mass. The process is not believed to be a malignant one. Diagnosis: Pheochromocytoma."

Report on microscopic examination of the kidney biopsy stated: "There is some proliferation of the cells of the glomerular tufts and cloudy swelling of the convoluted tubules. No arterioles are present in the section examined. Diagnosis: Proliferative glomerulonephritis."

Convalescence was uneventful with the exception of visual hallucinosis on the second day post-operatively, and in the 14 months since operation she has remained normotensive (range: 100–128 systolic; 64–80 diastolic). Several follow-up urinalyses have been normal and she has gained 35 pounds in weight and 3 inches in height during the 14 months since discharge from the hospital. Her mother says that her school grades are all G (good) and E (excellent) and that she has been in general robust health.

Ophthalmological follow-up by Dr. Marshall Parks on February 11, 1954, two weeks after operation, showed vision 18/200 in right eye, 1/200 in the left. Fundi still showed 4 diopters papilledema but no venous engorgement. On August 27, 1954, 7 months after operation, vision was 20/30 in the right eye, 20/200 in the left. Ocular alignment and motility were normal. The fundi showed massive scarring. There was no papilledema, and arterioles and arteriovenous crossing were normal.

DISCUSSION

Snyder and Vick[1] have listed a differential diagnosis of pheochromocytoma including the following conditions: (1) renal disease; (2) coarctation of the aorta; (3) acrodynia; (4) lead poisoning; (5) Cushing's syndrome; (6) hyperthyroidism; (7) tumors of the hypothalamus; (8) essential hypertension. Daeschner et al[2] caution that familial dysautonomia may produce a similar picture and may be associated with a positive Regitine test. We

were seriously concerned with only two other diseases than pheochromocytoma: nephritis and unilateral "Goldblatt kidney." The latter was readily eliminated by the retrograde pyelogram. A bold signpost leading away from nephritis existed in the form of the minimal renal impairment contrasted to the extremely malignant form of hypertension. The progression from a normal funduscopic picture to grade IV hypertensive retinopathy in the space of less than 2 months demonstrated graphically the rapid course of the disease. Viewed in the light of these observations the Regitine test proved virtually diagnostic.

Although blood pressure varied considerably as recorded twice daily during 4 weeks of observation (150 to 200 systolic, 90 to 160 diastolic), recognition of symptoms of paroxysmal attacks could not be noted by history or clinical observation.

The gradual return of good functional vision following relief of hypertension has been reported in other cured cases of pheochromocytoma, and had seemed to us one of the most remarkable aspects of the disease. It is interesting to contrast the extensive arteriolar disease in the fundi to the rather mild glomerular changes seen on kidney biopsy.

Shaefer et al.[3] and others have discussed the signs and symptoms usually associated with functioning pheochromocytoma including headache, hyperhidrosis, palpitation, angina, dyspnea, nervousness, anxiety, fever, tachycardia, retinal angiospasm, elevated basal metabolic rate, glycosuria, and hyperglycemia. Goldfarb[4] first brought attention to distressing and persistent constipation as a prominent symptom. His case, in fact, died while enemas were being given to relieve fecal impaction. Daeschner et al.[2] mentioned constipation as an outstanding symptom in their case. On pharmacologic grounds, one would expect most patients with functioning chromaffin tumor to display some degree of constipation.

In the English speaking literature we have found reported 16 other cases in children under 13 years of age who were observed to have clinical hypertension and pheochromocytoma at operation or autopsy. We have excluded the case mentioned by Soffer[5] because of lack of clinical data and one of Snyder and Vick's[1] seven cases for the same reason. This total includes 6 reported by Snyder and Vick, 1 additional by Ganem and Cahill[6] and Cahill[7] and 1 additional by Goldenberg et al,[8] all of whom apparently reported 2 cases included in Snyder and Vick's histories. Single cases have been discussed by Littman and State, Hubble,[10] Grimson et al.,[11] Neil and Smith,[12] Goldfarb,[4] Israelski et al.,[13] Daeschner et al.,[2] Shaefer et al.,[3] and Iseri et al.[14]

Seven of these children have been cured by surgery. Operative mortality was about 30 per cent. An eighth, reported by Iserietal,[14] was well 6 weeks after operation but had a malignant tumor. It would seem that the regime outlined by Daeschner et al.,[2] of oral Regitine given several days before

operation is to be highly recommended to prevent the wild and frequently disastrous fluctuations of blood pressure which occur during surgery. Their patient, a 4 year old white boy, experienced no hypertension on manipulation of the tumor, no hypotension following interruption of the vascular supply to the tumor, and no pressor medication was required after surgery.

We feel that surgery would have been infinitely safer for our patient had such a schedule of preoperative Regitine been employed.

SUMMARY

1. The cure of unilateral, benign pheochromocytoma in a 12 year old white girl is reported.

2. Seventeen other cases in children under 13 years of age with clinically observed hypertension were found in the American literature.

3. The value of an adrenergic blocking agent, phentolamine (Regitine) in diagnosis is again emphasized, and its use in pre-operative preparation is recommended.

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